PEACE/WILLISTON
FISH & WILDLIFE
COMPENSATION
PROGRAM

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Fish Habitat Enhancement Potential And Stocking Assessment Of Morfee Lake

A. R. McLean
1991

PWFWCP Report No. 122

The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

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Website: *www.bchydro.bc.ca/environment/initiatives/pwcp/*

This report has been approved by the Peace/Williston Fish and Wildlife Compensation Program Fish Technical Committee.

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MORFEE LAKE

WATERSHED: Parsnip River

DATE OF SURVEY: June 10. 11. 1991

FIELD CREW LEADER: A.R. McLean

FIELD ASSISTANT: A.R. Langston

PEACE FISHERIES COMPENSATION PROGRAM

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ENVIRONMENTAL RESOURCES

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FISH AND WILDLIFE BRANCH

REPORT PREPARED BY: A.R. McLean

Lake: **MORFEE**

INTRODUCTION

A standard fisheries baseline reconnaissance of Morfee Lake was carried out by the Fish and Wildlife Branch (Prince George) in June of 1970 and 1976. The reports (data sheets) are on file at the Ministry of Environment, Fish and Wildlife Branch, Prince George.

Morfee Lake has been stocked with rainbow trout since 1976. Lake trout were also stocked into the lake in 1978 (table 1).

Morfee Lake was investigated in June of 1991 by the Peace Fisheries Compensation Program to identify potential fisheries enhancement projects and to determine if alterations to the current stocking program are necessary.

STOCKING HISTORY

TABLE 1
MORFEE LAKE STOCKING HISTORY

Year	Species	Number	Size (grams)	Stage	Stock
1991	rainbow trout	10,000	9.6	yearling	Badger
1990	rainbow trout	15,000	16.6	yearling	Badger
1989	rainbow trout	15,000	10.6	yearling	Tunkwa
1988	rainbow trout	6,222	9.9	UN	Tunkwa
1988	rainbow trout	8,778	11.0	UN	Tunkwa
1987	rainbow trout	15,000	12.8	UN	Tunkwa
1986	rainbow trout	13,800	31.9	UN	Dragon
1985	rainbow trout	10,000	18.2	UN	Beaver
1984	rainbow trout	15,000	1.16	UN	Premier
1983	rainbow trout	20,000	4.0	UN	Premier
1982	rainbow trout	10,000	4.0	UN	Premier
1981	rainbow trout	10,000	5.7	UN	Premier
1980	rainbow trout	10,000	6.3	UN	Badger
1979	rainbow trout	15,000	27.8	UN	Spahomin
1978	rainbow trout	30,000	20.0	UN	Spahomin
1978	lake trout	154	714	UN	Moat
1978	lake trout	271	220	UN	Moat
1976	rainbow trout	15,000	13.7	UN	Pennask

LOCATION

Location: within the district of Mackenzie
Elevation: 716 m +/-
Latitude/Longitude: 55°21'12":123^{0}04'20" U.T.M.: 10.4950.61339
Management Unit: 7-30 N.T.S. Map No.: 93-0/6 (edition 2)

Drainage: Morfee C.–>Mugaha C.–>Williston Reservoir (Parsnip Reach)–>Peace R.

METHODS

Two sinking monofilament gill nets (14 and 2 hour sets) and two minnow traps (both 23 and 24 hour sets) were set to determine relative abundance and identification of fish species in Morfee Lake (See Appendix 1 for net set details) (See figure 1 for net set locations).

Rainbow trout were sampled for length, weight, sex, maturity, stomach contents and parasite/disease presence (Appendix 2). Scale samples were collected for age determination. General appearance of the rainbow trout was recorded through visual analysis. The total catch and size range of lake chub captured during the investigation was also recorded.

The fisheries enhancement potential of any inlets or outlets was determined through visual observation and recording of physical data, using standard methodologies outlined in the Fish/Habitat Inventory and Information Program (1987 Stream Survey Field Guide).

On site anglers were interviewed opportunistically. Salmonid catch per unit effort information was recorded from these anglers and angling undertaken by program staff.

The benchmark set during the initial study (1970) was located (figure 1). Any change in water level was measured using an eslon tape, in combination with a abney level.

Photo documentation of the investigation was also completed (see figure 1 for photo locations).

Figure I

Lake: **MORFEE**

RESULTS & DISCUSSIONS

Two net sets yielded 26 rainbow trout, 6 lake trout, 47 mountain whitefish, 3 lake whitefish, and 4 coarse fish species including northern squawfish (table 2). Two minnow traps yielded 2 sculpin, 5 peamouth chub and 2 northern squawfish (table 3). Average fork length, weight and condition factor was calculated for the 44 rainbow trout (18 angled) and 10 lake trout captured (table 4).

TABLE 2
LAKE CATCH SUMMARY

Species	Net Site Number				Angled	Other	Total	Number Sampled	Number Preserved	Size Range (cm)
	1	2	3	4						
rainbow trout	26				18		44	44		10.9-33.2
lake trout		6			4		10	10		33.7-58.0
mountain whitefish	45	2					47			12.5 - 28.5
lake whitefish	2	1					3			36.0-37.0
coarse sucker	59						59			10.0-38.0
longnose sucker	17						17			12.0 - 42.0
peamouth chub	20	4					24			17.0-28.5
northern squawfish	12						12			11.5-41.0

TABLE 3
MINNOW TRAP CATCH

#	Hours	Depth (m)	Substrate	Species	Size Range (cm)
1	23.75	1.2	organics	2 sculpins	
2	24.00	1.0	organics	5 peamouth chub 2 northern squawfish	2.0 - 6.0 5.0 - 10.0

Bait: Sardines

Lake: **MORFEE**

TABLE 4
AVERAGE LENGTH, WEIGHT AND CONDITION FACTOR

Rainbow Trout	Fork Length (cm)	Weight (grams)	Condition Factor
Number	44	44	44
Mean	22.2	156.7	1.08
Std	7.3	108.2	0.10
Min	10.9	14.6	0.93
Max	33.2	420	1.32
Lake trout	Fork Length (cm)	Weight (grams)	Condition Factor
Number	10	10	10
Mean	39.8	883.5	1.11
Std	9.3	780.1	0.15
Min	28.7	205	0.86
Max	58	2800	1.43
		Condition Factor Formula:	k = (W(grms) x 100)/L(cms)3

Lake: **MORFEE**

Length vs Age

An indication of growth rate is provided through the length/age relationship of the rainbow trout (table 5, figure 2) and lake trout (table 5).

TABLE 5
LENGTH/AGE RELATIONSHIP

Species	Age	Sample Size	Mean (cm)	Std. Dev.	Min (cm)	Max (cm)
rainbow trout	1	14	12.1	0.8	10.9	13.9
rainbow trout	2	15	25.7	2.3	17.9	29.4
rainbow trout	3	14	27.6	2.1	14.8	31.6
rainbow trout	4	1	33.2	-	-	-
lake trout	6	3	31.5	2.1	28.7	33.7
lake trout	7	1	35.9	-	-	-
lake trout	8	2	45.5	8.5	37.0	54.0
lake trout	10-12	1	32.0	-		-
lake trout	11	2	43.7	1.75	42.0	45.5
lake trout	7	1	-	-	-	-

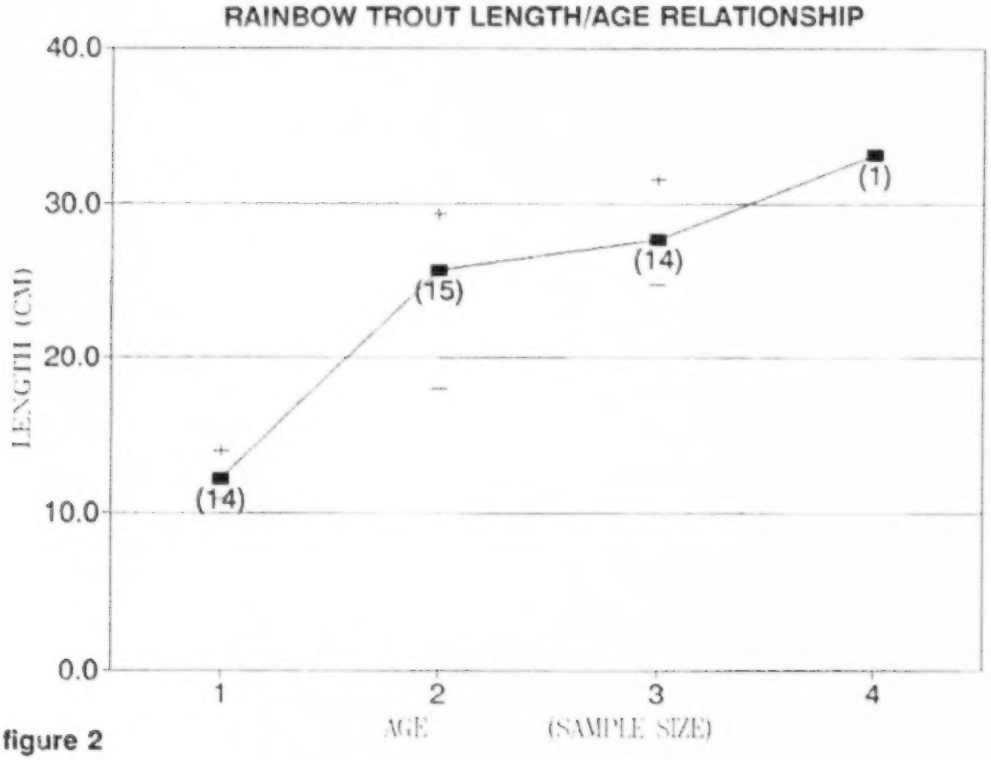

figure 2

Lake: **MORFEE**

Length vs Weight

The proportionate upward trend in the length/weight relationship of the rainbow trout in Morfee Lake is shown in figure 3.

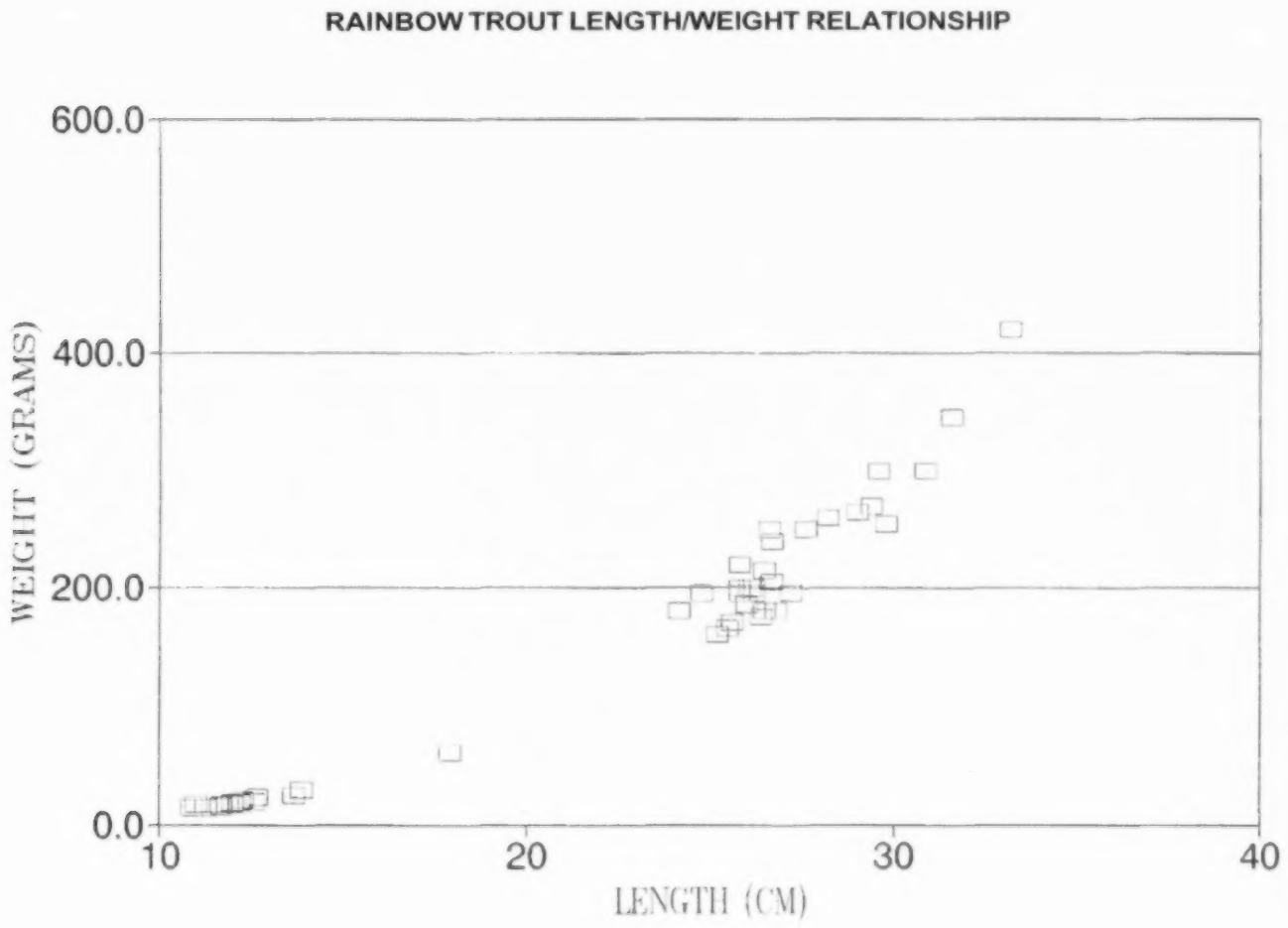

figure 3

Lake: **MORFEE**

BIOLOGICAL ANALYSIS OF RAINBOW TROUT

Biological analysis was conducted on only 13 of the rainbow trout. The remaining 13 rainbow trout captured in the net set were too small, and analysis of the angled rainbow trout was not appropriate. Stomach content analysis revealed a diet of mainly insects (beetles, dragon fly nymphs, caterpillars) and detritus. Zoo plankton was noted in 1 of the stomachs. Tapeworms were observed in 2 of the examined stomachs and in the body cavity of 5 rainbow trout. The internal organs of 4 rainbow trout were adhered to their body cavities. The rainbow trout looked healthy in appearance.

DRAINAGE

Unnamed Creeks - Intermittent inlets (2)

An intermittent inlet drains into the east side of the south basin, and the west side of the north basin of Morfee Lake. The two inlets were dry at the time of the survey.

Unnamed C. - Intermittent inlet #1 (Plates #1, #2)

The initial 300 m of this inlet, which drains into the east side of the north basin, was investigated. The inlet had an average wetted width of 3.8 m, average depth of 30 cm, a gradient of 0.1 % and a water temperature of 8°C, approx. 125 m upstream from the lake. This inlet was dry in August of 1990, indicating only seasonal flows. This inlet has moderate spawning substrate. However, a high percent of fines was present, thereby limiting salmonid survival. Juvenile rearing is good (undercut banks, overhanging vegetation, LOD).

Lake: **MORFEE**

Plate 1: Upstream view of inlet #1, taken approx. 125 m upstream from the lake.

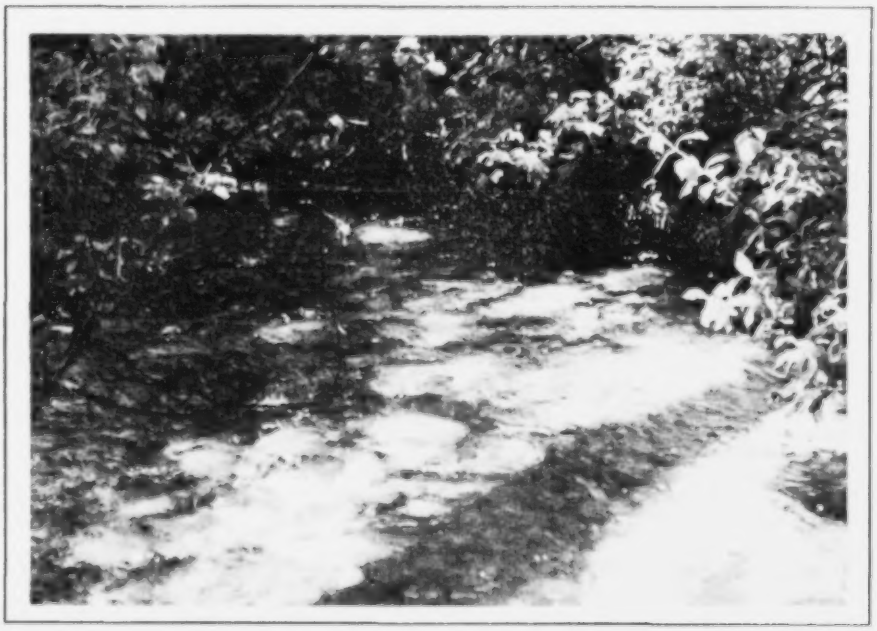

Plate 2: Downstream view of inlet #1, taken approx. 125 m upstream from the lake.

Morfee C. - outlet (Plates #3, #4)

The outlet is located at the north end of the lake. The initial 40 m of the outlet (downstream of the bridge crossing) has good spawning habitat. Excellent rearing habitat is located beyond the initial 40 m of the outlet.

Plate #3: Downstream view of outlet creek, taken from bridge located at lake outlet.

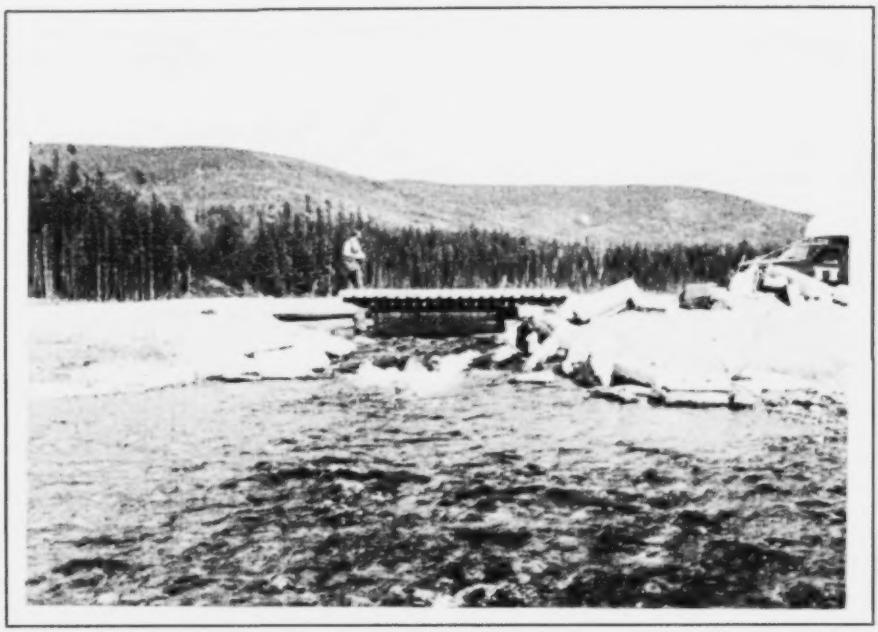

Plate #4: Upstream view of outlet creek, taken approx. 20 m downstream from lake. Lake level is controlled by concrete blocks in creek.

ANGLER USE AND CATCH PER UNIT EFFORT

Local anglers indicated a high success catch. Four anglers fishing for 2 hours caught 19 rainbow trout. Our own angling efforts (2 people) produced 4 rainbow trout and 2 lake trout in 3 hours. Catch per unit effort was measured at 5 salmonids per hour.

BENCHMARK

The original benchmark set in 1970 was located. It was originally set 4.87 m above the water level. The benchmark is now 5.16 m above the lake level. A 29 cm drop in lake level is apparent. However, as Morfee Lake is the water source for the Mackenzie District, water fluctuations are probably common. The benchmark is located 4 m from the lake edge, 10 m off the access road, in a 30 cm diameter lodgepole pine. The benchmark spike is 2.5 m above the base of the tree. The benchmark was repainted (orange).

Lake: **MORFEE**

MISCELLANEOUS COMMENTS

Juvenile and adult rainbow trout, mountain whitefish, longnose and coarse sucker and redside shiner were noted in the outlet creek and just upstream of the bridge crossing at the outlet.

Morfee Lake is the water source for the District of Mackenzie.

Lake level is controlled by concrete blocks, located at the outlet, to ensure an adequate water supply for Mackenzie.

RESORTS AND CAMPSITES

A boat launch, wharf, and parking area is located at the south end of the north basin. A wharf and picnic area is located on the west side of the south basin.

FISHERIES MANAGEMENT COMMENTS

Morfee Lake supports a population of rainbow trout, lake trout, mountain and lake whitefish and 4 species of coarse fish including northern squawfish. The rainbow trout captured during the investigation have a healthy appearance and appear to be in good condition (C.F. 1.11 (0.86-1.43)). However, limited growth between the 2 and 3 year old rainbow is apparent. Rainbow trout stomach content analysis revealed a diet mainly of insects. Intermittent inlet #1 has moderate spawning substrate but high fines content. Good rearing habitat was also noted. The outlet creek has good spawning habitat in the initial 40 m and excellent rearing habitat beyond. Salmonids (juvenile and adult) and numerous coarse fish species were noted in the outlet creek. Catch per unit effort was measured at 5 salmonids per hour. A total of 10,000 rainbow trout were stocked into Morfee Lake in 1991.

Stocking Program

The current stocking program appears to be successful, however thorough recommendations with regard to this cannot be made until total angler use and C.P.U.E. is assessed. Stocking Morfee Lake with the same frequency, density and strain of fish per year is recommended until 1995. This would significantly improve future stocking program evaluation recommendations. A stocking program evaluation is recommended in 1995.

Lake: **MORFEE**

Enhancement Potential

Bank stabilizing below the first bridge crossing on the outlet is recommended.

Investigating Morfee L. outlet and Morfee C. to verify presence/absence of spawners and investigate enhancement potential is also recommended.

Lake: MORFEE

APPENDIX 1

Lake: **MORFEE**

NETTING RECORD

Mesh sizes experimental order: 25, 76, 51, 89, 38, 64 mm

NETTING SITE #1

Type:	Sinking monofilament		
Date Set:	June 10, 1991	Time:	2200 hrs
Date Lifted:	June 11, 1991	Time:	1145 hrs*
Net Dimensions:	Length: 91.4 m	Depth:	2.4 m
Shallow End Mesh Size:	25 mm	Depth: Substrate:	1.0 m fines/organic
Deep End Mesh Size:	64 mm	Depth: Substrate:	16.0 m organics

Comments:

* Short set time due to angler presence.

NETTING SITE #2

Type:	Sinking monofilament		
Date Set:	June 11, 1991	Time:	1725 hrs
Date Lifted:	June 11, 1991	Time:	1900 hrs*
Net Dimensions:	Length: 91.4 m	Depth:	2.4 m
Shallow End Mesh Size:	25 mm	Depth: Substrate:	3.0 m fines/organics
Deep End Mesh Size:	64 mm	Depth: Substrate:	19.0 m fines/organics

Comments:

* Short set time due to anglers, water skiers, and concern for netting excess lake trout.

Lake: MORFEE

APPENDIX 2

Lake: **MORFEE**

INDIVIDUAL FISH DATA

Date Captured: June 11 & 12, 1991

Method of Capture: angled

M - Male
F - Female
? - Not Obvious

IMM - Immature
MG - Maturing
MT - Mature
GV - Gravid
SP - Spent
? - Not Obvious

EG - Egg
FR - Fin Ray
HD - Head
ML - Milt
OT - Otolith

SC - Scale
ST - Stomach
TG - Fish Tag
WF - Whole Fish

Species	Fork Lgth (cm)	Wght (g)	Sex	Gonadal maturity	Sample Type	Age (yr)	Stomach Contents				Comments
							Plankton	Insects	Fish	Other	
rainbow trout	10.9	14.8	?	IMM	SC	1+					
rainbow trout	11.0	16.7	?	IMM	SC	2+					
rainbow trout	11.3	14.6	?	IMM	SC	1+					
rainbow trout	11.6	16.2	?	IMM	SC	1+					
rainbow trout	11.7	16.0	?	IMM	SC	1+					
rainbow trout	11.9	16.3	?	IMM	SC	1+					
rainbow trout	12.0	16.7	?	IMM	SC	1+					
rainbow trout	12.0	17.8	?	IMM	SC	1+					
rainbow trout	12.2	17.8	?	IMM	SC	1+					
rainbow trout	12.3	20.8	?	IMM	SC	1+					
rainbow trout	12.6	19.8	?	IMM	SC	1+					
rainbow trout	12.7	23.2	?	IMM	SC	1+					
rainbow trout	13.7	24.4	?	IMM	SC	1+					
rainbow trout	13.9	28.8	?	IMM	SC	1+					
rainbow trout	24.2	180	-		SC	2+					silver bright
rainbow trout	24.8	195	-		SC	3+					silver bright
rainbow trout	25.5	165	-		SC	2+					silver bright
rainbow trout	25.6	170	-		SC	3+					silver bright
rainbow trout	25.8	195	-		SC	3+					silver bright
rainbow trout	26.0	185	-		SC	3+					silver bright
rainbow trout	26.1	200	-		SC	2+					silver bright
rainbow trout	26.2	195	F	IMM	SC	2+		unidentified insects		detritus	organs adhered to body wall
rainbow trout	26.4	175	-		SC	2+					silver bright
rainbow trout	26.5	180	M	IMM	SC	2+		unidentified larvae		tapeworms	
rainbow trout	26.7	205	-		SC	3+					silver bright
rainbow trout	26.7	240	F	MG	SC	2+				snails detritus	
rainbow trout	26.8	180	-		SC	2+					silver bright
rainbow trout	27.2	195	-		SC	3+					silver bright

Lake: **MORFEE**

Species	Fork Lgth (cm)	Wght (g)	Sex	Gonadal maturity	Sample Type	Age (yr)	Stomach Contents				Comments
							Plankton	Insects	Fish	Other	
rainbow trout	27.6	250	-		SC	3+					silver bright
rainbow trout	28.2	260	F	MG	SC	3+				detritus	organs adhered to body wall
rainbow trout	29.0	265	-		SC	3					silver bright
rainbow trout	29.6	300	-		SC	3+					silver bright
rainbow trout	29.8	255	-		SC	3+					silver bright
rainbow trout	30.9	300	-		SC	3+					silver bright
rainbow trout	31.6	345	-		SC	3+					silver bright

Lake: **MORFEE**

INDIVIDUAL FISH DATA

Date Captured: June 10 & 11, 1991

Method of Capture: sinking monofilament gillnet

M - Male
F - Female
? - Not Obvious

IMM - Immature
MG - Maturing
MT - Mature
GV - Gravid
SP - Spent
? - Not Obvious

EG - Egg
FR - Fin Ray
HD - Head
ML - Milt

SC - Scale
ST - Stomach
TG - Fish Tag
WF - Whole Fish
OT - Otolith

Species	Fork Lgth. (cm)	Wght (g)	Sex	Gonadal maturity	Sample Type	Age (yr)	Stomach Contents				Comments
							Plankton	Insects	Fish	Other	
rainbow trout	17.9	60	M	IMM	SC	2+	zoo plankton				
rainbow trout	25.2	160	F	MG	SC	2+		caterpillar		detritus	
rainbow trout	25.8	220	F	IMM	SC	3+				tapeworm detritus	organs adhered to body wall
rainbow trout	25.8	200	F	IMM	SC	2+		beetles			tapeworms in body cavity
rainbow trout	26.2	200	F	IMM	SC	2+		dragon fly nymph		detritus	tapeworms in body cavity
rainbow trout	26.5	215	F	MG	SC	2+		beetles			
rainbow trout	26.6	250	F	MT	SC	2+		beetles dragon fly nymphs		snail detritus	tapeworms in body cavity
rainbow trout	29.4	270	M	GV	SC	2+		beetles		detritus	tapeworms in body cavity
rainbow trout	33.2	420	F	MG	SC	4		beetles dragon fly nymph			organs adhered to body tapeworms in body cavity
lake trout	28.7	205	F	IMM	OT	6		unidentified larvae	1 sculpin		
lake trout	33.7	380	F	MT	OT	6		unidentified larvae			
lake trout	42.0	900	M	MG	OT	11				tapeworms detritus	
lake trout	45.5	900	F	MG	OT	11		unidentified larvae		detritus	
lake trout	54.0	1,850	F	MG	OT	8		dragon fly nymphs		snails	1 Otolith
lake trout	58.0	2,800	M	MT	OT						
lake trout											
lake trout											
lake trout											

AGE DETERMINATION COMPLETED BY:

Rainbow: **Margaret MacDonald, Box 243, Midway, B.C.**

Lake trout: **North/South Consultants Ltd., 2nd Floor, 1475 Chevrier Blvd. Winnipeg, Manitoba, Canada, R3T 1Y7**

AGE DETERMINATION (RAINBOW TROUT) VERIFIED BY:

Arne Langston, Peace Fisheries Compensation Program, Prince George, B.C.